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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/501,276	07/09/2004	Johannes F de Boer	36115/US/2 - 475387-00016	3104

30873 7590 12/18/2006

DORSEY & WHITNEY LLP
INTELLECTUAL PROPERTY DEPARTMENT
250 PARK AVENUE
NEW YORK, NY 10177

EXAMINER	
DETSCHEL, MARISSA	
ART UNIT	**PAPER NUMBER**
2877	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	12/18/2006	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/501,276	DE BOER ET AL.	
	Examiner	Art Unit	
	Marissa J. Detschel	2877	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 October 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *103-306* is/are pending in the application.

4a) Of the above claim(s) *237-301* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *103-236 and 302-306* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 July 2004* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *see 11 attached IDS's*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Applicant's election with traverse of groups a. and b., drawn to claims 103-237 and 302-306, in the reply filed on October 17, 2006 is acknowledged. The traversal is on the ground(s) that the two groups of claims recite at least one common or corresponding technical feature (page 41 of Applicant's Remarks).

The election is deemed proper and is therefore made FINAL.

Information Disclosure Statement

Receipt is acknowledged of the information disclosure statements filed on 9 July 2004, 25 April 2005, 18 August 2005, 5 October 2005, 7 November 2005, 12 December 2005, 19 January 2006, 21 February 2006, 17 March 2006, 19 June 2006, and 24 August 2006, which information entered into the application.

The numerous references and materials listed on the submitted 70 sheets of the IDS's make it difficult to determine whether or not any of the references, or parts of the references, are material to applicants' claimed invention. It is noted that applicants, in their several IDS submissions, do not indicate any particular reference or parts of references which they deem "material" to the patentability of the pending claims under 37 CFR 1.56(b).

Applicants are reminded of the standard set forth in the leading inequitable conduct case of *J.P. Stevens & Co. v. Lex Tex* Ltd., 747 F.2d 1553, 223 USPQ 1089 (Nov. 9, 1984), *cert. denied,* 106 S.Ct. 73 (1985): Where none of the prior art cited during prosecution teaches a key element of the claim(s) and where a reference known to the applicants does, the applicants should know that reference is material. Thus, if applicants are aware of any cited reference from among the information disclosure(s) of 9 July 2004, 25 April 2005, 18 August 2005, 5 October 2005, 7 November 2005, 12 December 2005, 19 January 2006, 21 February 2006, 17

March 2006, 19 June 2006, and 24 August 2006, that are "material," applicants should make that reference known to the examiner.

It is also noted that a "misrepresentation is material if it makes it impossible for the Patent Office fairly to assess [the patent] application against the prevailing statutory criteria." *In re Multidistrict-Litig. Involving Forst* Patent, 540 F.2d 601, 604, 191 USPQ 241, 243 (3d Cir. 1976); *see also Monsanto Co. v. Rohm & Haas Co.*, 456 F.2d 592, 600, 172 USPQ 323, 329 (3d Cir.), *ce.rt. denied,* 40'7 U.S. 934, 174 USPQ 129 (1972). And, the submission of voluminous documents in the instant information disclosure statements (here, in excess of 80 documents) make it difficult, and likely impossible, for the Patent Office to fairly assess applicants' application against the prevailing statutory criteria.

Therefore, the documents disclosed in the IDS's filed 9 July 2004, 25 April 2005, 18 August 2005, 5 October 2005, 7 November 2005, 12 December 2005, 19 January 2006, 21 February 2006, 17 March 2006, 19 June 2006, and 24 August 2006, have not been considered.

Drawings

New corrected drawings in compliance with 37 CFR 1.121(d) are required in this application because the drawings are full of stray markings in the background, handwritten labels for the reference figures that are somewhat difficult to read, and are just overall informal.

More specifically, the top half of figure 1 appears to have shading in the background of the areas labeled "Broadband Source" and "Reference Arm", making these areas very difficult to read.

Figure 3 includes handwritten labels for the reference figures that are difficult to read. There is also series of symbols next to the reference mirror of the reference arm (namely, a large black dot, a mailbox, and a computer mouse) that are not necessary.

Figure 4 includes handwritten labels for the reference figures that are difficult to read.

Figure 5 includes handwritten labels for the reference figures and some handwritten box labels that are difficult to read.

Figure 6 includes handwritten labels for the reference figures and some handwritten box labels that are difficult to read.

Figure 7 is very hard to read due to the gray blurred background behind the spectral band measurements.

Figure 8 is very hard to read due to the gray blurred background behind the Mach Zender interferometer.

Figure 10 includes a random box outline next to the box with the label "Processing unit, sum generation of offset and modulation signal" that is not necessary.

Figure 13 is difficult to understand due to the presence of a random box partially enclosing the "122" reference label for the slit lamp. Examiner believes this box should enclose the label "Slit Lamp"

Figures 15A-15C contain lines coming off the boxes that are used for reference labels, but there are no reference labels attached to the lines, signifying the labeled step illustrated in the boxes.

All of the drawings appear to contain stray background marks.

Applicant is advised to employ the services of a competent patent draftsperson outside the Office, as the U.S. Patent and Trademark Office no longer prepares new drawings. The corrected drawings are required in reply to the Office action to avoid abandonment of the application. The requirement for corrected drawings will not be held in abeyance.

Figure 1 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The

replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

Claims 103, 112, 123, 124, 127, 131, 142, 151-154, 159, 170, 179, 186, 197, 212, 213, 223, 232, and 303-306 are objected to because of the following informalities:

- As to claim 112, line 2, the phrase "at least one singe-dimensional detector array" should read "at least one single-dimensional detector array"

- As to claim 123, line 2, the phrase "reducing noise" should read "reduces noise"

- As to claim 127, the last line contains the limitation "the first and second arms" and there is insufficient antecedent basis for this. Examiner believes this should read "the first and second electro-magnetic radiations" since this limitation is included in 103.

- As to claim 131, line 4, the phrase "at least one of spectral separating unit" should read "at least one spectral separating unit"

- As to claim 142, line 2, the phrase "at least one singe-dimensional detector array" should read "at least one single-dimensional detector array"

- As to claim 151, line 2, the phrase "reducing noise" should read "reduces noise"

- As to claim 153, this claim contains the limitation "the received electro-magnetic radiations" and there is insufficient antecedent basis for this. Examiner suggests changing the dependency of this claim to claim 152, since this claim includes this limitation.

- As to claim 154, line 5, the phrase "the first and second polarization" should read "the first and second polarizations"

- As to claim 159, line 4, the phrase "at least one of spectral separating unit" should read "at least one spectral separating unit"

- As to claim 159, line 11, the phrase "reducing noise" should read "reduces noise"

- As to claim 170, line 2, the phrase "at least one singe-dimensional detector array" should read "at least one single-dimensional detector array"

- As to claim 197, line 2, the phrase "at least one singe-dimensional detector array" should read "at least one single-dimensional detector array"

- As to claim 212, line 2, the phrase "first electro-magnetic radiation" should read "one of the electro-magnetic radiations"

- As to claim 213, line 2, the phrase "first electro-magnetic radiation" should read "one of the electro-magnetic radiations"

- As to claim 223, line 2, the phrase "at least one singe-dimensional detector array" should read "at least one single-dimensional detector array"

- As to claims 303 and 304, the d. for the final step of the claim appears to have been crossed out and changed to a b. in the amendments filed in response to the restriction. However, the b. also appears to be crossed out, and this should not be the case.

- As to claim 305, line 2, the limitation "the housing" is included in this claim, and there is insufficient antecedent basis for this. Examiner suggests changing this to "a housing"

- As to claim 305, the second to the last line of the claim contains the limitation "the environment" and there is insufficient antecedent basis for this. Examiner suggests changing this to "an environment"

It has been held that the recitation that an element is "capable of" performing a function is not a positive limitation, but only required the ability to so perform. It does not constitute a limitation in any patentable sense. In re Hutchinson, 69 USPQ 138.

In view of this:

- As to claim 103, line 9, the phrase "capable of" should be removed.
- As to claim 124, lines 1-2, the phrase "is capable of receiving..., and detecting a polarization" should read "receives..., and detects a polarization"
- As to claim 131, line 9, the phrase "capable of" should be removed.
- As to claim 152, lines 1-2, the phrase "is capable of receiving..., and detecting a polarization" should read "receives..., and detects a polarization"
- As to claim 159, line 9, the phrase "capable of" should be removed.
- As to claim 179, lines 1-2, the phrase "is capable of receiving..., and detecting a polarization" should read "receives..., and detects a polarization"
- As to claim 186, line 9, the phrase "capable of" should be removed.
- As to claim 186, lines 10-11, the phrase "is capable of receiving..., and detecting a polarization" should read "receives..., and detects a polarization"
- As to claim 232, lines 2-3, the phrase "is capable of receiving..., and detecting a polarization" should read "receives..., and detects a polarization"

- As to claim 303, line 9, the phrase "capable of" should be removed.

- As to claim 304, line 9, the phrase "capable of" should be removed.

- As to claim 305, part iii, line 2, the phrase "capable of" should be removed.

- As to claim 306, part iii, line 2, the phrase "capable of" should be removed.

The numbering of claims is not in accordance with 37 CFR 1.126 which requires the original numbering of the claims to be preserved throughout the prosecution. When claims are canceled, the remaining claims must not be renumbered. When new claims are presented, they must be numbered consecutively beginning with the number next following the highest numbered claims previously presented (whether entered or not).

Misnumbered second claim 198 has been renumbered claim 199.

Applicant is advised that should claim 158 be found allowable, claim 185 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof. This also applies to claims 140 and 141, 166 and 167, 168 and 169, 193 and 194, and 195 and 196. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 120, 131, 158, 185, 304, and 306 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains

subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

These claims recite the limitation:

"wherein at least two of the detectors detect a common one of the frequency components, wherein a first one of the at least two of the detectors receives a first signal which has a first phase difference between the first and second electro-magnetic radiation, and a second one of the at least two of the detectors receives a second signal which has a second phase difference between the first and second electro-magnetic radiation, the first and second phase differences being different from one another."

How are these two different phase differences created and how do two separate detectors detect the two different phase differences, but detect a common frequency component? The applicant's specification fails to adequately disclose this limitation.

Claims 121, 122, and 132-157, which depend from claims 120 and 131, are also rejected under 35 U.S.C. 112, first paragraph.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 160, 161, 187, 188, 216, and 302 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

As to claims 160 and 187 these claims contain the limitation "the first and second ones of the detectors detect the common one of the frequency components" and there is insufficient antecedent basis for this. It is understood from the base claim that the detection arrangement includes "a plurality of detectors, each detector capable of detecting at least a portion of at least

one of the frequency components," but there is no detection of the common one of the frequency components disclosed. Where is this common one of the frequency components and how is it detected?

As to claim 161 and 188, these claims contain the limitation "the first and second phase differences" and there is insufficient antecedent basis for this. There are no first and second phase differences disclosed in the base claims of these claims. Therefore, where are these first and second phase differences and what are they first and second phase differences of?

As to claim 216 and 237, these claims contain the limitation "b. the frequency components of the first and second electro-magnetic radiations..." and there is insufficient antecedent basis for this. Where do these frequency components come from? The only part that is disclosed about any part of the beam interfering with itself is that "a. the first and second electromagnetic radiations interfere with one another" but this does not necessarily mean that the frequency components of the beams interfere with each other. Upon further examination of this claim, it is assumed by the Examiner that the frequency components of the beams interfere with each other because the first and second electro-magnetic radiations interfere with one another.

As to claim 217, the limitation "a common one of the frequency components" is included in this claim, and there is insufficient antecedent basis for this. Where do these frequency components come from? How do the "plurality of detectors detecting a common one of the frequency components" perform this function if there is only one combined light beam with an array of frequencies present?

As to claim 218, the limitations "the phase differences are different from one another..." is included in this claim, and there is insufficient antecedent basis for this. This implies that there

is more than one phase difference. Only one phase difference is disclosed in claim 216, lines 5-6. Where do these other phase differences come from?

Claim 302 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. As the claim reads, it is drawn to a storage medium including executable instructions that configure a processing system to perform the steps of obtaining an interferometric signal, modulating the signal to generate a second signal, mixing the first and second signals, generating an offset based on the mixed signal, controlling a phase of the first signal based on the offset, and generating an image. It is unclear as to how the processing system obtains the interferometric signal. There is no direct connection between the processing system, the interferometer, and the sample being measured. How does the processor gather the interferometric signal comprising a plurality of spectral bands? What is the signal a measurement of?

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 130, 158, 185, and 215 are rejected under 35 U.S.C. 101 because the claims are drawn to non-patentable subject matter.

The claims must either have a physical transformation and/or a concrete, useful, and tangible result. Although the claims appear to be useful and concrete, they are not tangible. Merely "enabling at least one detection of at least a portion of at least one of the frequency components..." would not appear to be sufficient to constitute a tangible result, since the outcome of the "enabling at least one detection..." step has not been used in a disclosed

practical application nor made available in such a manner that its usefulness in a disclosed practical application can be realized. What is this detected frequency used for and how is it applied? See OG Notices: 22 November 2005, "Interim Guidelines for Examination of Patent Applications for Patent Subject Matter Eligibility".

More specifically, Part b. *Practical Application the Produces a Useful, Concrete, and Tangible Result* under Section IV *Determine Whether the Claimed Invention Complies with the Subject Matter Eligibility Requirement of 35 U.S.C. Sec. 101* sentence 3 in the OG Notice from 22 November 2005 states 'In determining whether the claim is for a "practical application," the focus is not on whether the steps taken to achieve a particular result are useful, tangible, and concrete, but rather that the final result achieved by the claimed invention is "useful, tangible, and concrete."'

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 103-119, 123-130, 159, 162-185, 189-216, 219-237, 303, and 305 are rejected under 35 U.S.C. 103(e) as being anticipated by Ostrovsky et al. (USPN 7,006,231).

Regarding claims 103, 130, 159, 178, 186, 189, 205, 215, 216, 237, 303, and 306, Ostrovsky discloses an apparatus (Figure 5 below) and method for optical imaging, comprising:

receiving at least one first electro-magnetic radiation from a sample (119) and at least one second electro-magnetic radiation from a non-reflective reference (220);

Light is provided from a light source (102) to a 90/10 beamsplitter (202) through an optical fiber (106). 90% of the beam is sent to a sample (119) and 10% is sent through a reference (220). The sample light beam (i.e. the first electro-magnetic radiation) is sent to a circulator (204) to be sent to a sample (119), reflected therefrom, and sent to a 50/50 beamsplitter (222). The reference light beam (i.e. the second electro-magnetic radiation) is sent through an optical fiber (220) to the 50/50 beamsplitter. (column 10, lines 1-36) The optical fiber (220) represents a non-reflective reference.

separating spectrum (via 118) of at least one of the first electro-magnetic, the second electro-magnetic radiation and a combination of the first and second electro-magnetic radiation into frequency components; and

The reference light beam exits the fiber (220) goes through a collimator (116) and is directed onto a reflective diffraction grating (118). This separates the second electro-magnetic beam and sends it to the 50/50 beamsplitter (column 10, lines 36-44) enabling at least one detection of at least a portion of at least one of the frequency components using plurality of detectors (224, 226).

wherein at least one of:

a. the first and second electro-magnetic radiations interfere with one another, and

b. the frequency components of the first and second electro-magnetic radiations interfere with one another.

At the 50/50 beam splitter, the sample and reference beams are combined and sent to two photo detectors (224 and 226). (column 10, lines 45-53) Therefore, at least one of the first and second electro-magnetic radiations interfere with one another. The detectors may be tuned to detect light at different wavelength bands (column 11, lines 26-29), and, therefore, a detection of at least one frequency (i.e. wavelength) component is accomplished.

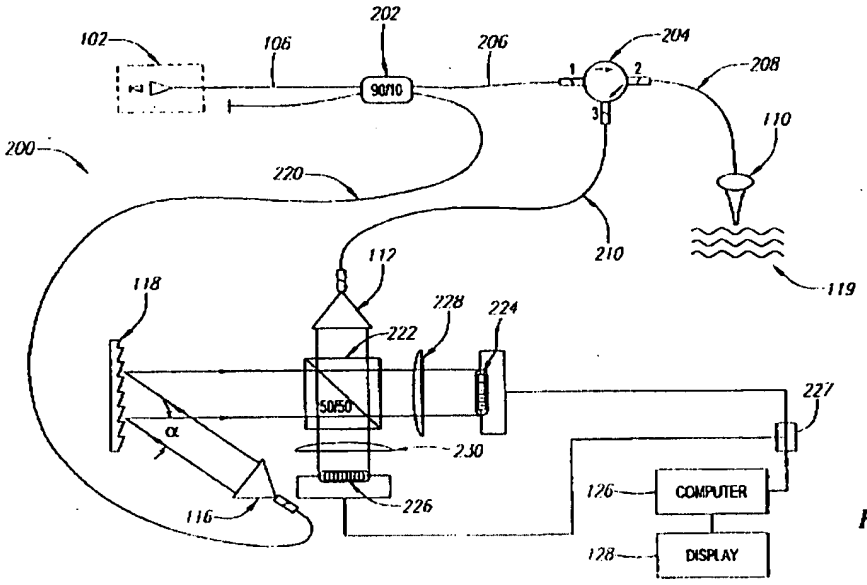

FIG. 5

In regards to claims 104, 162, 189, 219, and 231, the non-reflective reference of Ostrovsky is a transmissive reference. A fiber is a transmissive reference.

Regarding claim 105, 163, 190, and 220 the device of Ostrovsky further comprises at least one polarization controller. Another embodiment of Figure 5 is shown below as Figure 6. In this figure, a series of polarization filters can be implemented in the device. Two (240, 242) can be provided before the detectors. An alternative one (243) can be provided after the light source. (column 11, lines 31-55) These filters are examples of polarization controllers.

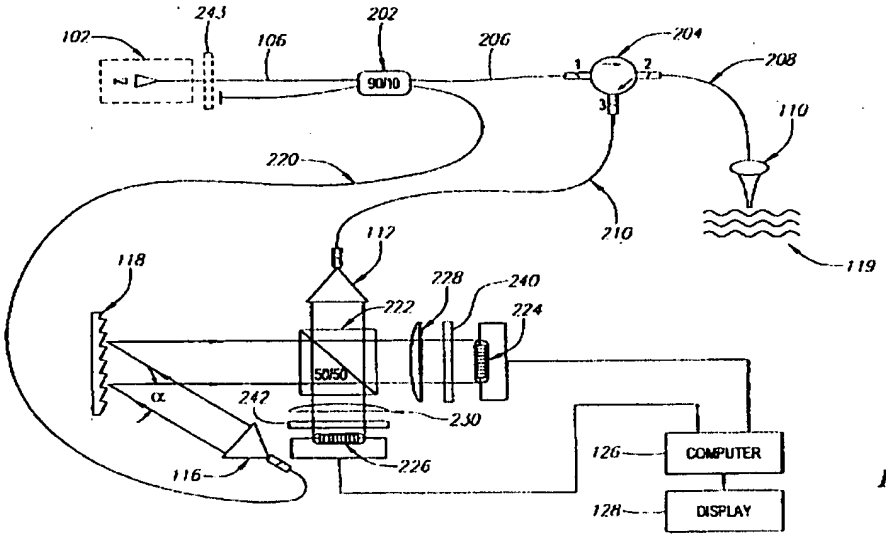

FIG. 6

In regards to claims 106, 164, 191, and 221, at least one polarization modulator is positioned in a path of at least one of the first electro-magnetic radiation and the second electro-magnetic radiation of Ostrovsky. The polarization filters mentioned with respect to claim 105 are examples of polarization modulators. The two (240, 242) are provided in the paths of the combined first and second electromagnetic radiations.

In regards to claims 107, 165, 192, and 222 the apparatus of Ostrovsky further comprises

A source (103) generating a third electro-magnetic radiation; and

At least one polarization modulator which is positioned in a path of at least one of the first electro-magnetic radiation, the second electro-magnetic radiation, and the third electro-magnetic radiation.

In yet another embodiment of figure 5, illustrated below in Figure 7, more than one light source (102, 103) can be provided. (column 11, line 66 to column 12, line 8) This second light

source (103) generates a third electro-magnetic radiation. Using the polarization detection embodiment of Figure 6, polarization modulators are positioned in the path of the combined first, second, and third electro-magnetic radiations.

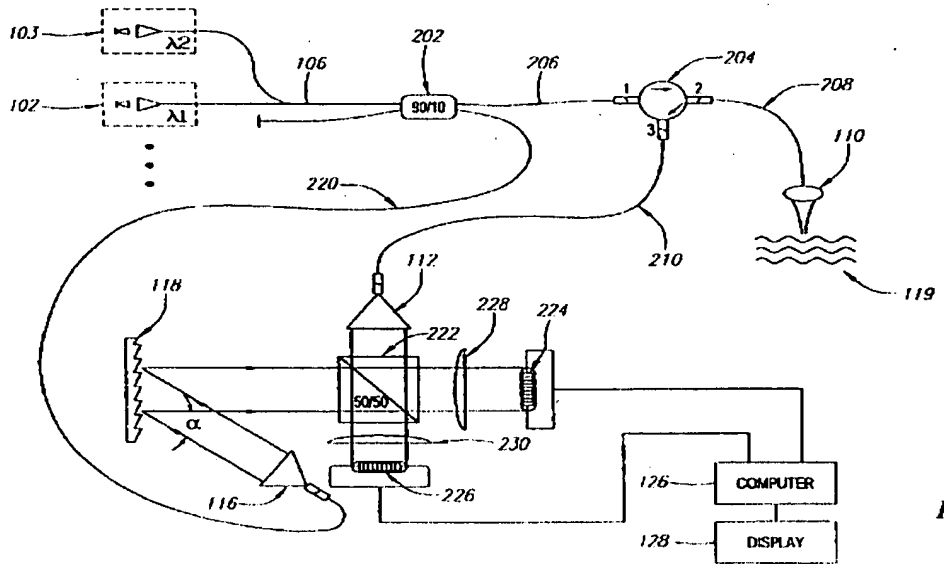

FIG. 7

Regarding claims 108, 166, and 193 the apparatus of Ostrovsky further comprises

A source generating a third electro-magnetic radiation; and

A splitter configured to separate the third electro-magnetic radiation into a fourth electro-magnetic radiation directed to the reference and a fifth electro-magnetic radiation directed to the sample.

As illustrated in figure 7 above, the light from the second source (103) generates a third electro-magnetic radiation. A splitter (202) separates the third electro-magnetic radiation into a fourth electromagnetic radiation directed to the reference and a fifth electro-magnetic radiation directed to a sample.

Regarding claims 109, 166, 167, 193, and 194 the splitter is at least one of a fiberoptic splitter and a bulk splitter. The splitter (202) is a fiberoptic splitter.

Regarding claims 110, 168, and 195 a splitter (222) is configured to combine the first and second electromagnetic radiations in the device of Ostrovsky.

Regarding claims 111, 168, 169, 195, and 196 the splitter is at least one of a fiberoptic splitter and a bulk optic splitter. This splitter (222) is a bulk optic splitter.

In regards to claims 112, 170, 197, 211, and 223 the detectors of Ostrovsky comprise at least one of (i) at least one single-dimensional detector array, and (ii) at least one multi-dimensional array. These detectors are multi-element photo detectors. (column 10, lines 50-53) This exemplifies a single detection array.

In regards to claims 113, 171, 198, and 224 the spectral separating unit comprises at least one of (i) at least one reflection grating, (ii) at least one transmission grating, and (iii) at least one spectrally dispersive element. The spectral separating unit is a reflective diffraction grating, as illustrated in the figures above.

Regarding claims 114, 172, 199, and 225 at least one charge coupled device is coupled to at least one detection arrangement of Ostrovsky. A charged coupled device can be used in the device of Ostrovsky (column 7, lines 50-51)

Regarding claims 115, 116, 173, 174, 200, 201, 226, and 227 at least one electronic bandpass filter is coupled to the detection arrangement of Ostrovsky. Bandpass filtering may be selected to optimize the use of specific wavelengths (column 12, lines 15-17).

Regarding claims 117, 175, 202, and 228 at least one analog to digital converter is coupled to the at least one detection arrangement of Ostrovsky. The analog circuitry (227) of

Figure 5 may convert the signals output from the detectors to digital signals (column 10, lines 63-67).

In regards to claims 118, 176, 203, and 229 at least one processing arrangement receiving information which is at least partially based on at least one of the components is coupled to the detection arrangement. The outputs of the detectors (224 and 226) are sent to a computer for processing. (column 12, lines 18-20)

In regards to claims 119, 177, 204, and 230 at least one acousto-optic modulator (117) is coupled to the at least one detection arrangement. If the detector used in any of the embodiments is a photodiode array and heterodyne detection is being performed, an acousto-optic modulator may be provided along any of the optical fibers of the reference and sample fibers. (column 8, lines 50-56)

In regards to claims 123 and 159, the detection arrangement generates at least one signal based on the frequency components and reduces noise of the at least one signal. The bandpass filtering disclosed in claims 115 and 116, and rejected above, are examples of reducing noise of the signal.

Regarding claims 124, 179, 186, and 232 the detection arrangement of Ostrovsky receives at least two electro-magnetic radiations and detects a polarization state of at least one electro-magnetic radiation. As illustrated above with reference to figure 6, the first and second electro-magnetic radiations are sent to a beamsplitter (222) where the two radiations are combined, and sent to subsequent detectors (224, 226). Since these beams are sent through polarization filters to polarize the radiations, the detectors sense a polarization state of the radiations. (column 11, lines 31-55)

In regards to claims 125, 180, 206, and 233 the received electro-magnetic radiations are generated by splitting a combination of the first and second electro-magnetic radiations using a polarization-sensitive arrangement. This is illustrated above in figure 6. The beamsplitter splits a combination of the first and second electro-magnetic radiations. The use of the polarization filters allows for a polarization-sensitive arrangement. (column 11, lines 31-55)

In regards to claims 126, 181, 207, and 234 a first one (224) of the at least two of the detectors receives a first signal which has a first polarization (via 240) of at least one of the first and second electro-magnetic radiations, and a second one (226) of at least two of the detectors receives a second signal which has a second polarization (via 242) of at least one of the first and second electro-magnetic radiations, the first and second polarizations being different from one another. (column 11, lines 31-55)

Regarding claim 127, 182, 208, 216, 237, Ostrovsky's apparatus does disclose a first arrangement for detecting a signal relating to the first and second electro-magnetic radiations, as disclosed above; and at least one second arrangement controlling at least one of the first and second electro-magnetic radiations based on the relative phase difference so as to facilitate a generation of at least one image associated with at least one of the first and second electro-magnetic radiations. The second arrangement is in the form of a programmable signal generator for driving the acousto-optic modulator (AOM 302) (column 15, lines 35-36). This controls the reference radiations since the AOM is found in the reference radiation path.

In yet another alternative embodiment of Figure 5, Figure 10 illustrates the use of an acousto-optic modulator (AOM 302) that introduces an optical path length difference to the reference radiation and introduces a frequency shift. (column 15, lines 20-24) This creates a phase difference, since the optical path difference of any combined reference and measurement

radiation is directly proportional to the relative phase difference between the reference and measurement radiations. Therefore, the detectors detect a phase difference between the measurement and reference radiations.

In regards to claim 128, 183, 209, and 235 the second arrangement controls a phase of at least one of the first and second electro-magnetic radiations. The second arrangement is in the form of a programmable signal generator for driving the acousto-optic modulator (AOM 302) (column 15, lines 35-36). This controls the reference radiations since the AOM is found in the reference radiation path.

In regards to claim 129, 184, 210, and 236 the second arrangement maximizes a signal to noise ratio of a signal associated with the at least one image. The signal due to the modulation from the AOM is processed using a narrow band amplifier tuned to the modulation to extract intensity variations to produce an image (column 3, lines 9-13) This maximizes the signal to noise ratio.

Regarding claim 212, the polarization state of the at least one of the electro-magnetic radiations is determined from electro-magnetic radiations received by the detectors. As illustrated above with reference to figure 6, the first and second electro-magnetic radiations are sent to a beamsplitter (222) where the two radiations are combined, and sent to subsequent detectors (224, 226). Since these beams are sent through polarization filters to polarize the radiations, the detectors sense a polarization state of the radiations. (column 11, lines 31-55)

Regarding claim 213, the polarization state of the at least one of the electro-magnetic radiations is determined from at least one of an amplitude and a phase difference of electro-magnetic radiations received by the detectors. Two separate images from each detector may be displayed separately, and differential measurements may be made by comparing the signals at

each detector as a function of position and intensity. Variations in intensity versus position are an indication of polarity sensitive areas (i.e. polarization states). (column 11, lines 40-45) Therefore, the polarization states are determined from an amplitude of the electro-magnetic radiations received by the detectors.

Regarding claim 214, the phase difference is determined from an amplitude of electro-magnetic radiations received by the detectors. As disclosed above with reference to claim 8, the phase difference is detected by the detectors, and, since the detectors detect the electro-magnetic radiations, the phase difference is determined from an amplitude of the radiations.

In regards to claim 303, the device of Ostrovsky as disclosed above with reference to claims 103, 130, 159, 178, 186, 189, 205, 215, 216, 237, and 303 can be used in Intravascular Ultrasound techniques to image a blood vessel and surrounding tissue. (column 16, lines 1-9 and Figure 12) Therefore, it exemplifies a probe for detecting atherosclerotic plaque in a blood vessel, since the images of the blood vessel and the surrounding tissue taken by the device would include this plaque, if any were present.

In regards to claim 306, the device of Ostrovsky as disclosed above with reference to claims 103, 130, 159, 178, 186, 189, 205, 215, 216, 237, 303 and 306 disclosed above is used as a device for imaging a blood vessel, heart or other organ, or a body tissue by guiding a flexible catheter through the body part being imaged. (column 9, lines 2-9) This flexible catheter represents a conduit. Furthermore, it is well-known that these types of imaging catheters can be used to deliver a therapeutic agent into the body part being imaged.

Claims 159, 167-170, and 173-177 are rejected under 35 U.S.C. 102(b) as being anticipated by Tearney et al. (USPN 6,134,003).

As to claim 159, Tearney discloses an apparatus for imaging (Figure 16 below) comprising:

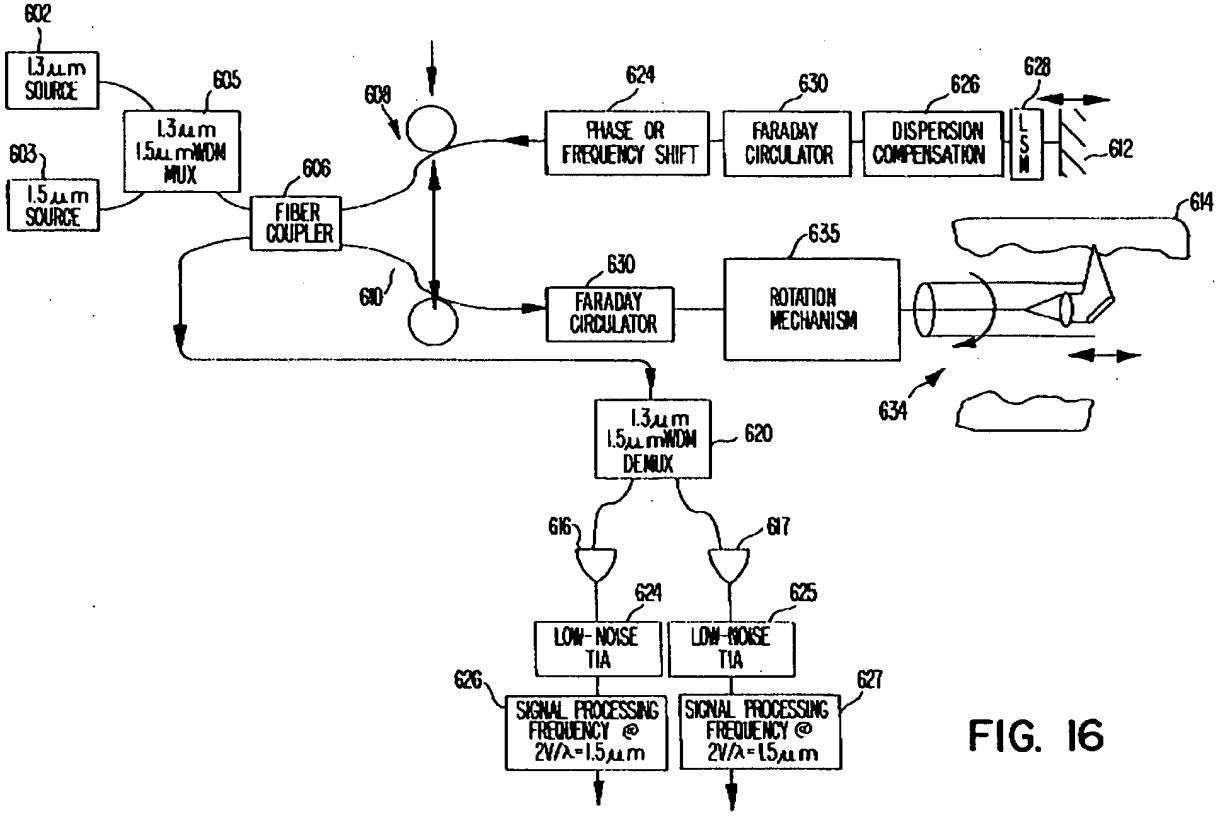

FIG. 16

A device receiving at least one first electro-magnetic radiation from a sample and at least one second electro-magnetic radiation from a reference;

Light emitted from two optical sources (602, 603) set at two different wavelengths is combined in a wavelength division multiplexer. The combined light is sent to an optical coupler (606). From the coupler, one beam (i.e. a first electro-magnetic radiation) is sent along a measurement arm (610) to an endoscopic unit (634) and the other (i.e. a second electro-magnetic radiation) is sent along a reference arm (608) to a reference reflector (612). Both beams are reflected from the reference reflector and a sample (614) and recombined in an optical coupler (606).

At least one spectral separating unit which separates spectrum of at least one of the first electromagnetic radiation, the second electro-magnetic radiation, and a combination of the first and second electro-magnetic radiations into frequency components; and

After the beams are recombined in the optical coupler, they reach a WDM demultiplexer (620). The demultiplexer separates the light back into the two different wavelengths of the two optical sources. This is also a separation of the spectrum of the combination of the first and second electro-magnetic radiations.

At least one detection arrangement including a plurality of detectors, each detector capable of detecting at least a portion of at least one of the frequency components, wherein the detection arrangement generates at least one signal based on the frequency components and reduces noise of the at least one signal,

Wherein at least one of:

a. the first and second electro-magnetic radiations interfere with one another, and

b. the frequency components of the first and second electro-magnetic radiations interfere with one another.

The signals from the demultiplexer are input into two detectors (616, 617), both of which detect a separate wavelength of light. The signals from the detectors are conditioned by a low noise transimpedance amplifier (624, 625) prior to being sent to two signal processing modules (626, 627). (column 16, lines 36-64) These signals are from the combined first and second electro-magnetic radiations. This configuration of the demultiplexing provides enhanced sensitivity, as there is detected shot noise from only one optical wavelength (column 17, lines 16-20). This is a reduction in noise of the signals.

In regards to claims 166 and 167, the apparatus of Tearney discloses

A source generating a third electro-magnetic radiation; and

A splitter configured to separate the third electro-magnetic radiation into a fourth electro-magnetic radiation directed to the reference and a fifth electro-magnetic radiation directed to the sample, wherein the splitter is at least one of a fiberoptic splitter and a bulk splitter.

The source generating the third electro-magnetic radiation is the second light source. When the light is combined with the radiation from the first light source, and is split by the coupler to be sent through the measurement and reference arms, the split light represents the third electro-magnetic radiation being split into a fourth radiation sent to the reference and the fifth radiation sent to the sample. The splitter is a fiberoptic splitter, as can be seen in the figure above.

Regarding claims 168 and 169, the apparatus of Terney further comprises a splitter configured to combine the first and second electro-magnetic radiaition, wherein the splitter is at least one of a fiberoptic splitter and a bulk optic splitter. The splitter (606) configured to combine the first and second electro-magnetic radiations is a fiberoptic splitter, as can be seen in the figure above.

In regards to claim 170, the detector is a single-dimensional detector array.

In regards to claims 173 and 174, the signal processing electronics of the device of Tearney may further include a digital signal processing unit which can perform a frequency analysis in several ways including implementing bandpass filters. (column 16, lines 4-8)

Regarding claim 175, an A/D converter can be used to provide phase-sensitive detection in the electronic processing unit (column 15, lines 60-64)

Regarding claim 176, the device includes at least one processing arrangement (626, 627) receiving information which is based on the wavelength (i.e. frequency) components. (column 16, lines 62-64)

In regards to claim 177, the device includes a phase modulator (624) that can be an acousto-optic modulator (column 13, lines 47-48) Since this modulator is applied to the reference beam path and modulates the reference beam, and this signal is sent to the detection arrangement after being combined with the sample beam, this acousto-optic modulator is coupled to the at least one detection arrangement.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Marissa J. Detschel whose telephone number is 571-272-2716. The examiner can normally be reached on M-F 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory J. Toatley, Jr. can be reached on 571-272-2059. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

December 7, 2006
MJD